

Ex situ conservation of these plants is going on in BSI, EC, Shillong under a DBT-funded project to conserve these species to some extent. Those associated with life sciences and its allied subjects are well aware of biodiversity and its importance, and also the need for its conservation, but many lay people are not aware of it. Therefore, the concerned authorities should take up measures such as organizing seminars and workshops. The Government of India has already introduced environmental education at the school and college level. The horticulture department should be encouraged to take up these plants for large-scale multiplication and breeding. *R. formosum*, being a shrub with magnificent flowers, can be propagated in large scale and distributed

for plantation in institutional and Government office campuses, public and private gardens, etc. Thus it can act as a good measure of *ex situ* conservation. *R. formosum* var. *inequale* being endemic and red-listed⁶, needs more attention.

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Plant tissue culture – answer to biodiversity conservation?

Plants have been an important source of medicine for thousands of years. Even today, the World Health Organization estimates that up to 80% of the people still rely mainly on traditional remedies. It is estimated that approximately one quarter of the prescribed drugs contains plant extracts. Thus, medicinal plants (MPs) are under tremendous pressure all across the globe, especially in India. More than 90% of the MPs for herbal industries in India and for export is drawn from the natural habitats¹, thus challenging their existence. Much has been written about the importance of plant tissue culture techniques in conserving rare/ endangered plant species and the pioneer role the technology will play in the future in India. A large sum of money is pumped every year to replenish the lost biodiversity and large number of protocols are available at present. Unfortunately, we are not witnessing any improvement in the status of these plant species in nature² and the current IUCN Red List reveals that the number of threatened plant species is increasing gradually³. The European and most of the Asian countries are rapidly exploiting this technology at a commercial level to conserve genetic species. In India, though the protocols are being developed at a rapid pace by the Government and academic institutions, in spite of International co-operation, it has not reached the desired level of commercialization. On one hand, forests are vigorously used by the pharmaceutical

sector and on the other hand the species are not being restored rapidly, resulting in a sharp decline in the forest cover. In Indonesia, a better public–private sector partnership has resulted in the production of 5 million plants per annum. This is likely to go up to 15 million in the coming years. Business development and technology transfer, adaptation and adoption from the developed countries to Thailand were rapid and have resulted in 30 commercial plant tissue culture companies. In India, more than 50 commercial laboratories were set up between 1987 and 1995 with a total capacity of 210 million plants/annum, which has declined in the recent years⁴. If the technology has to really flourish and play an active role in the conservation of rare/ endangered MPs, it has to be implemented at a commercial level. The Indian Government should take the much required initiative and setup sophisticated laboratories in every state, which are specifically meant for the purpose of propagating a large number of MPs. Such laboratories would also help in conserving endemic and endangered plants. In addition, the area of secondary metabolite production *in vitro* should be exploited so that drug plants in nature are not harmed. There are a few national laboratories in India which work in this particular area but this aspect definitely requires collaborative and serious working at the grassroot level for enhanced production of such bioactive components, to ease the path for novel and faster

drug development. Fresh strategies of afforestation management and restoration of depleting natural resources blending with modern technologies are also required. Tissue culture laboratories should be made mandatory for the pharmaceutical sector (herbal/drug companies) to reduce the pressure on natural habitats. A strong message regarding importance of biodiversity and its conservation should be spread among the youth and tribal communities, which rely heavily on genetic species through common meetings. Though tissue culture technology is potent and has opened extensive areas of research for biodiversity conservation, it surely needs to be revived and utilized in a broader spectrum rather than confined to publications.

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